

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 August 2002 (22.08.2002)

PCT

(10) International Publication Number
WO 02/065184 A3

(51) International Patent Classification⁷: G02B 27/12,
G02F 1/1335, G02B 27/09, B41J 2/45, G02F 1/13357

(21) International Application Number: PCT/US02/04742

(22) International Filing Date: 12 February 2002 (12.02.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/782,387 12 February 2001 (12.02.2001) US

(71) Applicant: SILICON LIGHT MACHINES [US/US];
385 Moffett Park Drive, Suite 115, Sunnyvale, CA 94089
(US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN,
YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,
GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

Published:

— with international search report

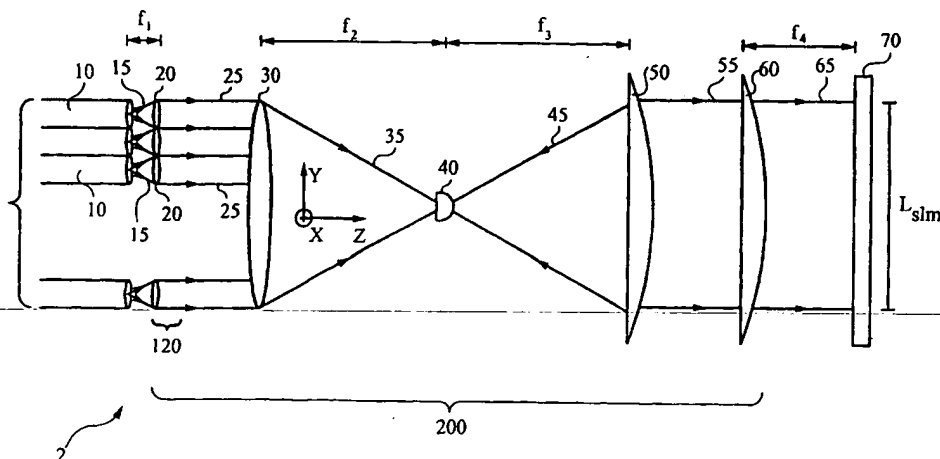
(72) Inventors: CARLISLE, Clinton; 562 Driscoll Place, Palo
Alto, CA 94306 (US). TRISNADI, Jahja, I.; 21800 San
Fernando Avenue, Cupertino, CA 95014 (US).

(74) Agents: HAVERSTOCK, Thomas, B. et al.; Haverstock
& Owens LLP, 162 North Wolfe Road, Sunnyvale, CA
94086 (US).

(88) Date of publication of the international search report:
20 March 2003

[Continued on next page]

(54) Title: AN ILLUMINATION SYSTEM FOR ONE-DIMENSIONAL SPATIAL LIGHT MODULATORS EMPLOYING MULTIPLE LIGHT SOURCES



(57) Abstract: The present invention is directed to illuminating a one-dimensional spatial light modulator (70) using an illumination system employing multiple light sources (10). The illumination system comprises a parallel array of light sources which provides a plurality of light outputs to an optical train (200). The optical train effectively combines the light sources into a single light source. The single light source provides a single light output for uniformly illuminating the spatial light modulator. The optical train includes a first optical train for receiving the light outputs from each light source, magnifying each light output, and overlaying each of the light outputs to form a single real magnified image. A mode conversion lens receives the single real magnified image, converts a mode profile of the single real magnified image into a top hat mode profile, and outputs a diverging light beam with a top hat mode profile. A second optical train shapes the light beam into an appropriate spatial geometry in such a manner that the light beam effectively illuminates the entire spatial light modulator, and directs the light beam onto the spatial modulator.

WO 02/065184 A3

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G02B27/12 G02F1/1335 G02B27/09 B41J2/45 G02F1/13357

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G02B B41J G02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 923 475 A (KESSLER DAVID ET AL) 13 July 1999 (1999-07-13) column 3, line 46 -column 5, line 40; figure 1 column 6, line 54 -column 7, line 20 column 11, line 1 - line 26 ---	1,2,4-9, 11, 13-15, 17-22
X	EP 1 040 927 A (EASTMAN KODAK CO) 4 October 2000 (2000-10-04) page 3, line 16 - line 23 page 4, line 5 - line 35; figures 1,2 ---	1-3
X	EP 1 003 071 A (EASTMAN KODAK CO) 24 May 2000 (2000-05-24) column 8; figure 1A --- -/--	1,3,13, 18,22

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

25 November 2002

Date of mailing of the international search report

02/12/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

von Moers, F

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 6 084 626 A (RAMANUJAN SUJATHA ET AL) 4 July 2000 (2000-07-04)</p> <p>column 5, line 60 -column 7, line 22; figure 1</p> <p style="text-align: center;">-----</p>	<p>1-4, 8-13, 17, 18, 21, 22</p>

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 5923475	A	13-07-1999	DE	19751106 A1	28-05-1998
			JP	10175325 A	30-06-1998
EP 1040927	A	04-10-2000	US	6169565 B1	02-01-2001
			EP	1040927 A2	04-10-2000
			JP	2000313141 A	14-11-2000
EP 1003071	A	24-05-2000	US	6215547 B1	10-04-2001
			EP	1003071 A2	24-05-2000
			JP	2000272170 A	03-10-2000
US 6084626	A	04-07-2000	DE	19918391 A1	04-11-1999
			JP	11337891 A	10-12-1999